PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classificati n 6 :
C11B 11/00, C08L 91/06, A23D 9/00, 9/02

A1

(11) International Publication Number: **WO 98/45390**

(43) International Publication Date: 15 October 1998 (15.10.98)

(21) International Application Number: PCT/AU98/00234

(22) International Filing Date: 7 April 1998 (07.04.98)

(30) Priority Data:
PO 6050 7 April 1997 (07.04.97) AU

(71) Applicants *(for all designated States except US)*: JAMES COOK UNIVERSITY OF NORTH QUEENSLAND [AU/AU]; Townsville, QLD 4811 (AU). CSR LIMITED [AU/AU]; Level 6, Hall Chadwick Building, 46 Edward Street, Brisbane, QLD 4000 (AU).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: VALIX, Marjorie, Gan [AU/AU]; 26 Andrews Street, West Ryde, NSW 2114 (AU).

(74) Agent: CULLEN & CO.; Level 12, 240 Queen Street, Brisbane, QLD 4000 (AU).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: FOOD GRADE WAX AND PROCESS FOR PREPARING SAME

(57) Abstract

The invention provides a wax composition which can be used in comestibles. The wax composition is obtained from sugar cane and comrpises wax esters, aldehydes, tri-glycerides, alcohols, free fatty acids, sterols and polar lipids. A process for preparing a wax composition from crude sugar cane wax, the process comprising the steps of: (i) heating a solution of the crude wax with a lower alcohol as sovlent at the boiling point of the solvent; (ii) allowing phase separation of the solution from (i) and decanting the upper phase while hot; (iii) allowing the separated phase from (ii) to cool and separating crystallised wax from the solvent; (iv) repeating steps (i) to (iii) using the wax from (iii) until all pitch has been removed fromthe wax; (v) heating the wax to between 90 and 140 °C and oxidising molten wax with oxidising material; and (vi) continuing the heating under and inert gas on completion of the oxidation step until intermediate peroxide products are removed.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania
AM	Armenia
AT	Austria
AU	Australia
AZ	Azerbaijan
BA	Bosnia and Herzegovina
BB	Barbados
BE	Belgium
BF	Burkina Faso
BG	Bulgaria
BJ	Benin
BR	Brazil
BY	Belarus
CA	Canada
CF	Central African Republic
CG	Congo
CH	Switzerland
CI	Côte d'Ivoire
CM	Cameroon
CN	China
CU	Cuba
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
GA	Gabon
GB	United Kingdom
GE	Georgia
GH	Ghana
GN	Guinea
GR	Greece
HU	Hungary
IE	Ireland
IL	Israel
IS	Iceland
IT	Italy
JP	Japan
KE	Kenya
KG	Kyrgyzstan
KP	Democratic People's Republic of Korea
KR	Republic of Korea
KZ	Kazakstan
LC	Saint Lucia
LI	Liechtenstein
LK	Sri Lanka
LR	Liberia
LS	Lesotho
LT	Lithuania
LU	Luxembourg
LV	Latvia
MC	Monaco
MD	Republic of Moldova
MG	Madagascar
MK	The former Yugoslav Republic of Macedonia
ML	Mali
MN	Mongolia
MR	Mauritania
MW	Malawi
MX	Mexico
NE	Niger
NL	Netherlands
NO	Norway
NZ	New Zealand
PL	Poland
PT	Portugal
RO	Romania
RU	Russian Federation
SD	Sudan
SE	Sweden
SG	Singapore
SI	Slovenia
SK	Slovakia
SN	Senegal
SZ	Swaziland
TD	Chad
TG	Togo
TJ	Tajikistan
TM	Turkmenistan
TR	Turkey
TT	Trinidad and Tobago
UA	Ukraine
UG	Uganda
US	United States of America
UZ	Uzbekistan
VN	Viet Nam
YU	Yugoslavia
ZW	Zimbabwe

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 98/00234

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: C11B 11/00; C08L 91/06; A23D 9/00, 9/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: C11B 11/00; A23D 9/00, 9/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Derwent Abstract Accession No: 92-111526/14, Class D23 (D21), JP 04-057894 A (KOBAYASHI KOSE KK) 25 February 1992 Abstract	1
A	Derwent Abstract Accession No: 51771C-30, Class D21, DT 2856-277 (HENKEL KG AUF AKTIEN) 17 July 1980 Abstract	1
A	Derwent Abstract Accession No: 95-085711/12, Class B07, D23 (D13, D21), JP 07-011285 A (NISSHIN OIL MILLS LTD) 13 January 1995 Abstract	2-17

[X] Further documents are listed in the continuation of Box C

[ ] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 May 1998	6 May 1998
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	Authorized officer **GAYE HOROBIN** Telephone No.: (02) 6283 2069

INTERNATIONAL SEARCH REPORT

	International Application No. PCT/AU 98/00234

C (Continuation) **DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Derwent Abstract Accession No: 94-269708/33, Class D23, JP 06-200289 A (NIPPON PETROCHEMICALS CO LTD) 19 July 1994 Abstract	2-17
A	Derwent Abstract Accession No: 94-269706/33, Class D23, JP 06-200287 A (NIPPON PETROCHEMICALS CO LTD) 19 July 1994 Abstract	2-17

ATENT COOPERATION TREAT

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 97520 KFGA	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International application No. **PCT/AU 98/00234**	International filing date *(day/month/year)* 7 April 1998	Priority Date *(day/month/year)* 7 April 1997
International Patent Classification (IPC) or national classification and IPC **Int. Cl.**[6] C11B 11/00, C08L 91/06, A23D 9/00, 9/02		
Applicant James Cook University of North Queensland		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of **3** sheets, including this cover sheet.

   [X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of **2** sheet(s).

3. This report contains indications relating to the following items:

I	[X]	Basis of the report
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[ ]	Certain observations on the international application

Date of submission of the demand 29 October 1998	Date of completion of the report 9 March 1999
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. (02) 6285 3929	Authorized Officer **GAYE HOROBIN** Telephone No. (02) 6283 2069

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/AU 98/00234

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed.

☒ the description, pages **,1-11** as originally filed,
pages , filed with the demand,
pages , filed with the letter of .

☒ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages **12, 13** filed with the letter of **3 March 1999 .**

☐ the drawings, pages , as originally filed,
pages , filed with the demand,
pages , filed with the letter of .

☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , filed with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, was on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:
☐ the description, pages
☐ the claims, Nos.
☐ the drawings, sheets/fig

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-17	YES
	Claims		NO
Inventive step (IS)	Claims	1-17	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-17	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

NOVELTY (N), INVENTIVE STEP (IS)

No citation or obvious combination of citations discloses a wax produced by the claimed process. The nearest art is considered to be that of JP 6-200287 and JP 6-200289 which disclose alternative methods of purifying crude sugar cane wax.

CLAIMS

1. A food grade wax composition comprising on a weight basis: wax esters, 6.2–11%; aldehydes, 2.8–9.5%; tri-glycerides, 0–3%; alcohols, 1.8–44.5%; and, free fatty acids, sterols and polar lipids, 36.8–87.2%.

2. A process for preparing a wax composition from crude sugar cane wax, the process comprising the steps of:

i) heating a solution of the crude wax with a lower alcohol as solvent at the boiling point of the solvent;

ii) allowing phase separation of the solution from (i) and decanting the upper phase while hot;

iii) allowing the separated phase from (ii) to cool and separating crystallised wax from the solvent;

iv) repeating steps (i) to (iii) using the wax from (iii) until all pitch has been removed from the wax;

v) heating the wax to between 90 and 140°C and oxidising molten wax with oxidising material; and

vi) continuing the heating under an inert gas on completion of the oxidation step until intermediate peroxide products are removed.

3. The process according to claim 2, wherein said lower alcohol is ethanol or iso-propanol.

4. The process according to claim 2, wherein said crude wax is combined with solvent at a ratio of 1:8 to 1:20 by weight.

5. The process according to claim 4, wherein said ratio is 1:9.

6. The process according to claim 2 wherein in step (i) said solution is heated for 5 to 60 minutes.

7. The process according to claim 6, wherein said solution is heated for about 30 minutes.

8. The process according to claim 2, wherein in step (iii) said separation is by filtration or centrifugation.

9. The process according to claim 2, wherein steps (i) to (iii) are repeated from 2 to 5 times.

10. The process according to claim 2, wherein in step (v) said heating is carried out under an oxygen-free gas.

11. The process according to claim 10, wherein said gas is nitrogen.

12. The process according to claim 2, wherein said oxidising material of step (v) is selected from the group consisting of air, oxygen, and mixtures of oxygen, nitrogen and ozone.

13. The process according to claim 2, wherein in step (v) said oxidation is carried out in the presence of a catalyst.

14. The process according to claim 10, wherein said catalyst is selected from the group consisting of a borate or resinate of cobalt or manganese, ferrous salts, and Fenton's reagent.

15. The process according to claim 2 comprising the further steps of:

vii) heating wax from step (vi) with a lower alcohol as solvent at the boiling point of the solvent with activated carbon present at a wax to carbon ratio of 1:0.5 to 1:3;

viii) filtering the molten slurry while hot;

ix) allowing the recovered wax/solvent mixture to cool and separating crystallised wax therefrom.

16. The process according to claim 2 comprising the further steps of:

(vii) heating wax composition from step (vi) with a lower alcohol as solvent at the boiling point of said solvent for 30 to 60 minutes;

(viii) allowing phase separation of the solution from (vi) and decanting the upper phase while hot;

(ix) allowing the separated upper phase from (viii) to cool and separating crystallised wax from said solvent;

(x) heating wax from (ix) in the absence of solvent for 15 minutes to 3 hours; and

(xi) repeating steps (vii) to (x) until the desired degree of decolourisation is achieved.

17. A comestible which includes the food grade wax composition of claim 1.

'ATENT COOPERATION TREA

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 97520KFGA	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. **PCT/AU 98/00234**	International filing date *(day/month/year)* 7 April 1998	(Earliest) Priority Date *(day/month/year)* 7 April 1997

Applicant
(1) JAMES COOK UNIVERSITY OF NORTH QUEENSLAND et al
(2) VALIX, Marjorie Gan

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of **four** sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. [ ] **Certain claims were found unsearchable** (See Box I)

2. [ ] **Unity of invention is lacking** (See Box II)

3. [ ] The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing

   [ ] filed with the international application

   [ ] furnished by the applicant separately from the international application,

      [ ] but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed

   [ ] transcribed by this Authority

4. With regard to the **title**,

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

   [ ] the text is approved as submitted by the applicant

   [X] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is:

   Figure No.

   [ ] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure

   [ ] because this figure better characterises the invention

   [ ] None of the figures

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The invention provides a wax composition which can be used in comestibles. The wax composition is obtained from sugar cane and comprises wax esters, aldehydes, tri-glycerides, alcohols, free fatty acids, sterols and polar lipids.

A process for preparing a wax composition from crude sugar cane wax, the process comprising the steps of:

(i) heating a solution of the crude wax with a lower alcohol as solvent at the boiling point of the solvent:

(ii) allowing phase separation of the solution from (i) and decanting the upper phase while hot;

(iii) allowing the separated phase from (ii) to cool and separating crystallised wax from the solvent;

(iv) repeating steps (i) to (iii) using the wax from (iii) until all pitch has been removed from the wax;

(v) heating the wax to between 90 and 140°C and oxidising molten wax with oxidising material; and

(vi) continuing the heating under an inert gas on completion of the oxidation step until intermediate peroxide products are removed.

INTERNATIONAL SEARCH REPO[illegible]

International Application No.
PCT/AU 98/00234

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: C11B 11/00; C08L 91/06; A23D 9/00, 9/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: C11B 11/00; A23D 9/00, 9/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Derwent Abstract Accession No: 92-111526/14, Class D23 (D21), JP 04-057894 A (KOBAYASHI KOSE KK) 25 February 1992 Abstract	1
A	Derwent Abstract Accession No: 51771C-30, Class D21, DT 2856-277 (HENKEL KG AUF AKTIEN) 17 July 1980 Abstract	1
A	Derwent Abstract Accession No: 95-085711/12, Class B07, D23 (D13, D21), JP 07-011285 A (NISSHIN OIL MILLS LTD) 13 January 1995 Abstract	2-17

[X] Further documents are listed in the continuation of Box C

[ ] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
1 May 1998

Date of mailing of the international search report
-6 MAY 1998

Name and mailing address of the ISA/AU
AUSTRALIAN PATENT OFFICE
PO BOX 200
WODEN ACT 2606
AUSTRALIA
Facsimile No.: (02) 6285 3929

Authorized officer

GAYE HOROBIN

Telephone No.: (02) 6283 2069

C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Derwent Abstract Accession No: 94-269708/33, Class D23, JP 06-200289 A (NIPPON PETROCHEMICALS CO LTD) 19 July 1994 Abstract	2-17
A	Derwent Abstract Accession No: 94-269706/33, Class D23, JP 06-200287 A (NIPPON PETROCHEMICALS CO LTD) 19 July 1994 Abstract	2-17

09/402362

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* 97520KFGA

Box No. I TITLE OF INVENTION

FOOD GRADE WAX AND PROCESS FOR PREPARING SAME

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

JAMES COOK UNIVERSITY OF NORTH QUEENSLAND
Townsville, Queensland 4811
Australia

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State *(i.e. country)* of nationality: AU

State *(i.e. country)* of residence: AU

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

CSR LIMITED
Level 6
Hall Chadwick Building
46 Edward Street
Brisbane, Queensland 4000
Australia

This person is:

☒ applicant only

☐ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality: AU

State *(i.e. country)* of residence: AU

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

CULLEN & CO
Level 12, 240 Queen Street
Brisbane, Queensland 4000
Australia

Telephone No. 07 3221 8761

Facsimile No. 07 3229 3384

Teleprinter No.

☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS

If none of the following sub-boxes is used, this sheet is not to be included in the request.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

VALIX, Marjorie Gan
26 Andrews Street
West Ryde, New South Wales 2114
Australia

This person is:
- [ ] applicant only
- [X] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality: AU

State *(i.e. country)* of residence: AU

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [X] the United States of America only
- [ ] the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

This person is:
- [ ] applicant only
- [ ] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality:

State *(i.e. country)* of residence:

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [ ] the United States of America only
- [ ] the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

This person is:
- [ ] applicant only
- [ ] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality:

State *(i.e. country)* of residence:

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [ ] the United States of America only
- [ ] the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

This person is:
- [ ] applicant only
- [ ] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality:

State *(i.e. country)* of residence:

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [ ] the United States of America only
- [ ] the States indicated in the Supplemental Box

- [ ] Further applicants and/or (further) inventors are indicated on another continuation sheet.

B x No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked)*:

Regional Patent

- ☒ **AP** **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA** **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA** **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)* .....

National Patent *(if other kind of protection or treatment desired, specify on dotted line)*:

- ☒ **AL** Albania .....
- ☒ **AM** Armenia .....
- ☒ **AT** Austria .....
- ☒ **AU** Australia .....
- ☒ **AZ** Azerbaijan
- ☒ **BA** Bosnia and Herzegovina .....
- ☒ **BB** Barbados
- ☒ **BG** Bulgaria .....
- ☒ **BR** Brazil .....
- ☒ **BY** Belarus
- ☒ **CA** Canada
- ☒ **CH and LI** Switzerland and Liechtenstein
- ☒ **CN** China .....
- ☒ **CU** Cuba .....
- ☒ **CZ** Czech Republic .....
- ☒ **DE** Germany .....
- ☒ **DK** Denmark .....
- ☒ **EE** Estonia .....
- ☒ **ES** Spain .....
- ☒ **FI** Finland .....
- ☒ **GB** United Kingdom
- ☒ **GE** Georgia .....
- ☒ **GH** Ghana .....
- ☒ **GM** Gambia
- ☒ **GW** Guinea-Bissau .....
- ☒ **HU** Hungary .....
- ☒ **ID** Indonesia
- ☒ **IL** Israel .....
- ☒ **IS** Iceland
- ☒ **JP** Japan .....
- ☒ **KE** Kenya .....
- ☒ **KG** Kyrgyzstan .....
- ☒ **KP** Democratic People's Republic of Korea .....
- ☒ **KR** Republic of Korea .....
- ☒ **KZ** Kazakhstan .....
- ☒ **LC** Saint Lucia
- ☒ **LK** Sri Lanka
- ☒ **LR** Liberia
- ☒ **LS** Lesotho .....
- ☒ **LT** Lithuania
- ☒ **LU** Luxembourg
- ☒ **LV** Latvia
- ☒ **MD** Republic of Moldova .....
- ☒ **MG** Madagascar .....
- ☒ **MK** The former Yugoslav Republic of Macedonia .....
- ☒ **MN** Mongolia
- ☒ **MW** Malawi .....
- ☒ **MX** Mexico .....
- ☒ **NO** Norway
- ☒ **NZ** New Zealand .....
- ☒ **PL** Poland .....
- ☒ **PT** Portugal .....
- ☒ **RO** Romania
- ☒ **RU** Russian Federation .....
- ☒ **SD** Sudan
- ☒ **SE** Sweden
- ☒ **SG** Singapore
- ☒ **SI** Slovenia .....
- ☒ **SK** Slovakia .....
- ☒ **SL** Sierra Leone
- ☒ **TJ** Tajikistan .....
- ☒ **TM** Turkmenistan .....
- ☒ **TR** Turkey .....
- ☒ **TT** Trinidad and Tobago .....
- ☒ **UA** Ukraine .....
- ☒ **UG** Uganda .....
- ☒ **US** United States of America .....
- ☒ **UZ** Uzbekistan .....
- ☒ **VN** Viet Nam .....
- ☒ **YU** Yugoslavia .....
- ☒ **ZW** Zimbabwe .....

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☒ And all other states since January 1998
- ☐ .....
- ☐ .....

In addition t the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of _____.
The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)*

See Notes to the request form

Box No. VI PRIORITY CLAIM Further priority claims are indicated in the Supplemental Box ☐

The priority of the following earlier application(s) is hereby claimed:

Country *(in which, or for which, the application was filed)*	Filing Date *(day/month/year)*	Application No.	Office of filing *(only for regional or international application)*
item (1) AUSTRALIA	7 April 1997 (07.04.97)	PO6050	
item (2)			
item (3)			

Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):

☒ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s) : (1)

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):* ISA /

Earlier search *Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request:*

Country (or regional Office): Date *(day/month/year)*: Number:

Box No. VIII CHECK LIST

This international application contains the following number of sheets:

1. request	: 4	sheets
2. description	: 11	sheets
3. claims	: 2	sheets
4. abstract	: 1	sheets
5. drawings	:	sheets
Total	: 18	sheets

This international application is accompanied by the item(s) marked below:

1. ☒ separate signed power of attorney
2. ☐ copy of general power of attorney
3. ☐ statement explaining lack of signature
4. ☐ priority document(s) *identified in Box No. VI as item(s):*
5. ☒ fee calculation sheet
6. ☐ separate indications concerning deposited microorganisms
7. ☐ nucleotide and/or amino acid sequence listing (diskette)
8. ☐ other *(specify)*:

Figure No. _____ of the drawings (if any) should accompany the abstract when it is published.

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Ronald A. Haliday
Registered Patent Attorney
Cullen & Co

For receiving Office use only

1. Date of actual receipt of the purported international application:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority specified by the applicant: ISA /
6. ☐ Transmittal of search copy delayed until search fee is paid

2. Drawings:
☐ received:
☐ not received:

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

PATENT COOPERATION TREA

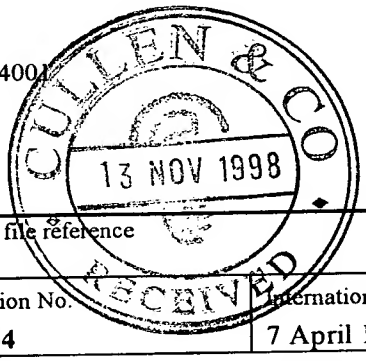
09/402362

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

CULLEN & CO
GPO Box 1074
BRISBANE QLD 4001



WRITTEN OPINION

(PCT Rule 66)

Date of mailing *(day/month/year)*	12 NOV 1998
Applicant's or agent's file reference 97520 KFGA	**REPLY DUE** within **TWO MONTHS** from the above date of mailing
International application No. **PCT/AU 98/00234**	International filing date *(day/month/year)* 7 April 1998
Priority Date *(day/month/year)* 7 April 1997	

International Patent Classification (IPC) or both national classification and IPC

Int. Cl.[6] C11B 11/00, C08L 91/06, A23D 9/00, 9/02

Applicant

JAMES COOK UNIVERSITY OF NORTH QUEENSLAND et al

1. This written opinion is the **first** (first, etc) drawn by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:.

I	[X]	Basis of the opinion
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[X]	Certain observations on the international application

The applicant is hereby **invited to reply** to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4*bis*.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **7 August 1999**

Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. (02) 6285 3929	Authorized Officer **GAYE HOROBIN** Telephone No. (02) 6283 2069

WRI N OPINION

International application No.
PCT/AU 98/00234

I. Basis of the opinion

1. With regard to the **elements** of the international application:*

[X] the international application as originally filed.

[ ] the description, pages , as originally filed,
pages , filed with the demand,
pages , filed with the letter of .

[ ] the claims, pages , as originally filed,
pages , as amended under Article 19,
pages , filed with the demand,
pages , filed with the letter of .

[ ] the drawings, pages , as originally filed,
pages , filed with the demand,
pages , filed with the letter of .

[ ] the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , filed with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

[ ] the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

[ ] the language of publication of the international application (under Rule 48.3(b)).

[ ] the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

[ ] contained in the international application in printed form.

[ ] filed together with the international application in computer readable form.

[ ] furnished subsequently to this Authority in written form.

[ ] furnished subsequently to this Authority in computer readable form.

[ ] The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

[ ] The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. [ ] The amendments have resulted in the cancellation of:

[ ] the description, pages

[ ] the claims, Nos.

[ ] the drawings, sheets/fig

5. [ ] This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

** Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"*

WRITTEN OPINION

International application No.
PCT/AU 98/00234

V. **Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-17	YES
	Claims		NO
Inventive step (IS)	Claims	1-17	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-17	YES
	Claims		NO

Citations and explanations

NOVELTY (N), INVENTIVE STEP (IS

No citation or obvious combination of citations discloses a wax produced by the claimed process. The nearest art is considered to be that of JP 6-200287 and JP 6-200289 which disclose alternative methods of purifying crude sugar cane wax.

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Certain claims are not fully supported by the description:

(a) Claim 1 is not limited to a wax produced by the process of the invention but would include the defined composition produced by any means whatsoever.

(b) Claim 17 is similarly not limited to a wax produced by the process of the invention. Furthermore the claim is not limited to food grade waxes.

CULLEN & CO.

Patent & Trade Mark Attorneys

G.P.O. Box 1074
Brisbane Q 4001

Speed Dial
536

Tel: (07) 3221 8761
Fax: (07) 3229 3384

OUR REF: 97520KFGA

3 March 1999

The Commissioner of Patents,
Woden, A.C.T. 2606.

Sir,

Australian Patent Application No. PCT/AU98/00234 entitled FOOD GRADE WAX AND PROCESS FOR PREPARING SAME in the names of JAMES COOK UNIVERSITY OF NORTH QUEENSLAND and CSR LIMITED

In connection with the written opinion mailed January 28, 1999, the applicants request amendment of the application. Specifically, please replace pages 12 and 13 of the claims with the accompanying pages 12 and 13.

The amendments to the claims are as follows:

> claim 1 has been amended by inserting the words "food grade" before "wax composition" in the first line of the claim; claims 2 to 16 are unchanged; claim 17 has been amended by inserting the words "food grade" before "wax composition".

As the amendments are responsive to the observations made in the opinion, we look forward to receipt of an international preliminary examination report which is free of adverse opinions.

Yours respectfully,
CULLEN & CO.

Ken Finney

KEN FINNEY

Enc: Replacement pages 12 and 13

CLAIMS

1. A food grade wax composition comprising on a weight basis: wax esters, 6.2–11%; aldehydes, 2.8–9.5%; tri-glycerides, 0–3%; alcohols, 1.8–44.5%; and, free fatty acids, sterols and polar lipids, 36.8–87.2%.

2. A process for preparing a wax composition from crude sugar cane wax, the process comprising the steps of:

i) heating a solution of the crude wax with a lower alcohol as solvent at the boiling point of the solvent;

ii) allowing phase separation of the solution from (i) and decanting the upper phase while hot;

iii) allowing the separated phase from (ii) to cool and separating crystallised wax from the solvent;

iv) repeating steps (i) to (iii) using the wax from (iii) until all pitch has been removed from the wax;

v) heating the wax to between 90 and 140°C and oxidising molten wax with oxidising material; and

vi) continuing the heating under an inert gas on completion of the oxidation step until intermediate peroxide products are removed.

3. The process according to claim 2, wherein said lower alcohol is ethanol or iso-propanol.

4. The process according to claim 2, wherein said crude wax is combined with solvent at a ratio of 1:8 to 1:20 by weight.

5. The process according to claim 4, wherein said ratio is 1:9.

6. The process according to claim 2 wherein in step (i) said solution is heated for 5 to 60 minutes.

7. The process according to claim 6, wherein said solution is heated for about 30 minutes.

8. The process according to claim 2, wherein in step (iii) said separation is by filtration or centrifugation.

9. The process according to claim 2, wherein steps (i) to (iii) are repeated from 2 to 5 times.

10. The process according to claim 2, wherein in step (v) said heating is carried out under an oxygen-free gas.

11. The process according to claim 10, wherein said gas is nitrogen.

12. The process according to claim 2, wherein said oxidising material of step (v) is selected from the group consisting of air, oxygen, and mixtures of oxygen, nitrogen and ozone.

13. The process according to claim 2, wherein in step (v) said oxidation is carried out in the presence of a catalyst.

14. The process according to claim 10, wherein said catalyst is selected from the group consisting of a borate or resinate of cobalt or manganese, ferrous salts, and Fenton's reagent.

15. The process according to claim 2 comprising the further steps of:

vii) heating wax from step (vi) with a lower alcohol as solvent at the boiling point of the solvent with activated carbon present at a wax to carbon ratio of 1:0.5 to 1:3;

viii) filtering the molten slurry while hot;

ix) allowing the recovered wax/solvent mixture to cool and separating crystallised wax therefrom.

16. The process according to claim 2 comprising the further steps of:

(vii) heating wax composition from step (vi) with a lower alcohol as solvent at the boiling point of said solvent for 30 to 60 minutes;

(viii) allowing phase separation of the solution from (vi) and decanting the upper phase while hot;

(ix) allowing the separated upper phase from (viii) to cool and separating crystallised wax from said solvent;

(x) heating wax from (ix) in the absence of solvent for 15 minutes to 3 hours; and

(xi) repeating steps (vii) to (x) until the desired degree of decolourisation is achieved.

17. A comestible which includes the food grade wax composition of claim 1.

PATENT COOPERATION TREA

09/402362

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

WRITTEN OPINION

(PCT Rule 66)

To:

Cullen & Co.
GPO Box 1074
BRISBANE QLD 4001

Date of mailing *(day/month/year)*	28 JAN 1999
Applicant's or agent's file reference 97520KFGA	**REPLY DUE** within **ONE MONTH** from the above date of mailing

International application No.	International filing date *(day/month/year)*	Priority Date *(day/month/year)*
PCT/AU 98/00234	7 April 1998	7 April 1997

International Patent Classification (IPC) or both national classification and IPC

Int. Cl.[6] C11B 11/00, C08L 91/06, A23D 9/00, 9/02

Applicant

JAMES COOK UNIVERSITY OF NORTH QUEENSLAND et al.

1. This written opinion is the **second** (first, etc) drawn by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:.

I	[X]	Basis of the opinion
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[X]	Certain observations on the international application

3. The applicant is hereby **invited to reply** to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4*bis*.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **7 August 1999**

Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. (02) 6285 3929	Authorized Officer **GAYE HOROBIN** Telephone No. (02) 6283 2069

WRITTEN OPINION

International application No.
PCT/AU 98/00234

I. Basis of the opinion

1. With regard to the **elements** of the international application:*

- [X] the international application as originally filed.
- [ ] the description, pages , as originally filed,
  pages , filed with the demand,
  pages , filed with the letter of .
- [ ] the claims, pages , as originally filed,
  pages , as amended under Article 19,
  pages , filed with the demand,
  pages , filed with the letter of .
- [ ] the drawings, pages , as originally filed,
  pages , filed with the demand,
  pages , filed with the letter of .
- [ ] the sequence listing part of the description:
  pages , as originally filed
  pages , filed with the demand
  pages , filed with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:
   - [ ] the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
   - [ ] the language of publication of the international application (under Rule 48.3(b)).
   - [ ] the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:
   - [ ] contained in the international application in printed form.
   - [ ] filed together with the international application in computer readable form.
   - [ ] furnished subsequently to this Authority in written form.
   - [ ] furnished subsequently to this Authority in computer readable form.
   - [ ] The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - [ ] The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. [ ] The amendments have resulted in the cancellation of:
   - [ ] the description, pages
   - [ ] the claims, Nos.
   - [ ] the drawings, sheets/fig

5. [ ] This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

** Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"*

V. **Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-17	**YES**
	Claims		**NO**
Inventive step (IS)	Claims	1-17	**YES**
	Claims		**NO**
Industrial applicability (IA)	Claims	1-17	**YES**
	Claims		**NO**

Citations and explanations

NOVELTY (N), INVENTIVE STEP (IS)

No citation or obvious combination of citations discloses a wax produced by the claimed process. The nearest art is considered to be that of JP 6-200287 and JP 6-200289 which disclose alternative methods of purifying crude sugar cane wax.

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Certain claims are not fully supported by the description:

(a) Claim 1 is not limited to food grade waxes, which from the first sentence of the description would appear to be precisely the field in which the invention is to be used.

The attorney has submitted that the wax composition of claim 1 is inherently food grade, however the invention defined by claim 1 does not reflect this. As it stands, the composition of claim 1 can include non-food grade compounds amongst eg. the alcohols, aldehydes or sterols. From a reading of the description this is clearly not within the intended scope of the invention.

Claim 17 is similarly not fully supported by the description.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
C11B 11/00, C08L 91/06, A23D 9/00, 9/02

A1

(11) Internati nal Publication Number: **WO 98/45390**

(43) International Publicati n Date: 15 October 1998 (15.10.98)

(21) International Application Number: PCT/AU98/00234

(22) International Filing Date: 7 April 1998 (07.04.98)

(30) Pri rity Data:
PO 6050 7 April 1997 (07.04.97) AU

(71) Applicants *(for all designated States except US)*: JAMES COOK UNIVERSITY OF NORTH QUEENSLAND [AU/AU]; Townsville, QLD 4811 (AU). CSR LIMITED [AU/AU]; Level 6, Hall Chadwick Building, 46 Edward Street, Brisbane, QLD 4000 (AU).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: VALIX, Marjorie, Gan [AU/AU]; 26 Andrews Street, West Ryde, NSW 2114 (AU).

(74) Agent: CULLEN & CO.; Level 12, 240 Queen Street, Brisbane, QLD 4000 (AU).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: FOOD GRADE WAX AND PROCESS FOR PREPARING SAME

(57) Abstract

The invention provides a wax composition which can be used in comestibles. The wax composition is obtained from sugar cane and comrpises wax esters, aldehydes, tri–glycerides, alcohols, free fatty acids, sterols and polar lipids. A process for preparing a wax composition from crude sugar cane wax, the process comprising the steps of: (i) heating a solution of the crude wax with a lower alcohol as sovlent at the boiling point of the solvent; (ii) allowing phase separation of the solution from (i) and decanting the upper phase while hot; (iii) allowing the separated phase from (ii) to cool and separating crystallised wax from the solvent; (iv) repeating steps (i) to (iii) using the wax from (iii) until all pitch has been removed fromthe wax; (v) heating the wax to between 90 and 140 °C and oxidising molten wax with oxidising material; and (vi) continuing the heating under and inert gas on completion of the oxidation step until intermediate peroxide products are removed.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

420 Rec'd PCT/PTO 0 4 OCT 1999

FOOD GRADE WAX AND PROCESS FOR PREPARING SAME

TECHNICAL FIELD

This invention relates to a wax composition suitable for use in comestibles. The invention also relates to a process for preparing the composition.

BACKGROUND ART

Many comestibles include waxes added during preparation of the comestible. For example, wax is a component of chewing gum base. Waxes can also be used as protective coatings on comestibles such as cheeses and fruits. The waxes used for such purposes are typically mineral waxes such as montan wax extracted from lignites, peat waxes, ceresin wax and petroleum waxes. Among these mineral waxes, it appears that only petroleum based waxes are used in food applications: microcrystalline waxes, high melting point waxes and high sulfur microcrystalline waxes in particular. The US Food and Drug Administration (FDA) has established regulations for the use of petroleum wax (see 21 CFR 172.886 and 178.3710) and Japanese authorities consider petroleum waxes to be natural products and allows their use in products such as chewing gum. Although montan wax is not used directly in food applications, it is used in plastic processing such as plastic containers and wrappings which will come or may come into contact with food.

Use of mineral waxes in comestibles is undesirable. Mineral waxes are extracted from coal and crude petroleum oil. These raw materials contain organic chemicals which are toxic to humans. The food applicability of the waxes depends on the degree of refining or purification achieved and its usage has been regulated according to the specifications provided by authorities such as Ministry of Agriculture, Fisheries and Food, UK (The Mineral Hydrocarbons in Food Regulation, SI 1966 No. 1073. This regulation applies to England and Wales only, though similar regulations apply to Scotland and Northern Ireland). The refining achieved has been acceptable to food regulating authorities. However, recent studies have suggested toxicological effects of petroleum based waxes ("Recommendations on the use of mineral hydrocarbon in food", Food Advisory Committee 8/93, UK) and

the hydrocarbon imparted by packaging using mineral hydrocarbon waxes on food (Progress Report of the Working Party on Chemical Contaminants from Food Contact Materials: 1988 to 1992; Food Surveillance Paper No. 38, Ministry of Agriculture of Fisheries and Food). The Ministry of Agriculture, Fisheries and Food is at present reviewing studies on the toxicological impact of using petroleum based waxes as food additives and as a processing aid to update regulation of the usage of these waxes in food applications (Ministry of Agriculture of Fisheries and Food News Release 278/93 of 19 August 1993).

Waxes of plant origin are known. Indeed, the palm *Copernicia cerifera* is a source of the common wax, carnauba. Waxes can also be extracted from sugar cane and rice. Subject to the conditions used for extraction, waxes of plant origin should provide an alternative to mineral waxes for use in comestibles.

Sugar production results in a number of by-products, one of which is mill mud. Mill mud comprises crude wax and fats, fibre, sugar, crude protein and ash (SiO_2, CaO, P_2O_5 and MgO). A crude cane wax can be extracted from mill mud. However, the crude wax is unsuitable for use in comestibles as it has a foul odour and taste and is dark green to brown in colour due to the presence of contaminants. US Patent No. 2,464,189 describes a process for the refining of sugar cane wax. However, wax produced by this process is unsuitable for use in comestibles for the following reasons:

1) The refining process is not complete. The process is only a fractionation step which removes a resinous fraction (pitch) from the sugar cane wax. The wax colour still has to be removed and stabilised. The patentees suggested further processing—for example, bleaching with acid, decolourisation, emulsification (see Example 3, line 40).

2) The reagent used in the process (acetone) is not food grade.

3) Bleaching uses reagents such as chromic and sulfuric acid which are not food grade reagents.

Since by-products of sugar production are plentiful in countries such as Australia, it would be desirable to have a process for producing a wax from such by-product (i.e., mill mud) suitable for use in comestibles.

SUMMARY OF THE INVENTION

The object of this invention is to provide a sugar cane wax composition, and a process for preparing the composition, which wax is suitable for use in comestibles.

In one aspect, the invention provides a wax composition comprising on a weight basis: wax esters, 6.2–11%; aldehydes, 2.8–9.5%; triglycerides, 0–3.0%; alcohols, 1.8–44.5%; and, free fatty acids, sterols and polar lipids, 36.8–87.2%.

In a second aspect, the invention provides a process for preparing a wax composition from crude sugar cane wax, the process comprising the steps of:

i) heating a solution of the crude wax with a lower alcohol as solvent at the boiling point of the solvent;

ii) allowing phase separation of the solution from (i) and decanting the upper phase while hot;

iii) allowing the separated phase from (ii) to cool and separating crystallised wax from the solvent;

iv) repeating steps (i) to (iii) using the wax from (iii) until all pitch has been removed from the wax;

v) heating the wax to between 90 and 140°C and oxidising molten wax with oxidising material; and

vi) continuing the heating under an inert gas on completion of the oxidation step until intermediate peroxide products are removed.

In other aspects, the invention provides the wax composition product of the process according to the second aspect and comestibles which include a wax composition according to the first aspect or as the product of the process according to the second aspect.

BEST MODE AND OTHER MODES FOR CARRYING OUT THE INVENTION

The inventor has found that a wax composition suitable for inclusion in comestibles can be obtained from sugar cane. The composition is essentially odourless and colourless, desirable properties for compositions used as a comestible base or for coating comestibles.

Typical components of the wax composition according to the first aspect of the invention are set out in Table I below. The numbers in the table are the numbers of carbon atoms typically found in a member of a functional group. However, it will be appreciated that a member of a group may have a number of carbon atoms falling outside the indicated range. Members of groups are mostly straight chain saturated and unsaturated hydrocarbons.

Table I

Components of Groups of The Wax Composition

Functional Groups	Typical Components
Wax Esters	C16 (fatty acid)–C24(alcohol)–C16 (fatty acid)–C36 (alcohol)
Aldehydes	C28–C36
Tri-Glycerides	T48–T54 (total number of carbon in the acyl group) or C16–C18 (number of carbons in each acyl group)
Alcohols	C24–C36
Free Fatty Acid	C24–C36
Alkanes	C25–C35

The polar lipids in the wax are essentially amphipathic molecules, having a hydrophobic fatty acid part and a hydrophilic domain. The three which are commonly found are *phosphoglycerides,* in which fatty acids are esterified with an alcohol (glycerol) which contain a phosphate group, *glycosyl diglycerides* in which the fatty acids are esterified with an alcohol (glycerol) which contains a carbohydrate (sugars) and *sphingolipids* in which the fatty acids are esterified with an alcohol (glycerol) which contains amino groups.

As indicated above in the description of the second aspect, the method of refining the crude sugar cane wax involves heating the crude wax with an organic solvent to allow the pitch and the paler wax fraction to separate. These form two distinct phases, which can be separated by decantation. The paler wax fraction is cooled to allow the wax to crystallise and separate from the oil which remains soluble in the organic solvent. The wax is filtered until

dry. The wax is melted over a hot bath and oxidised by blowing fine air bubbles through a sparger. This is continued until oxidation is complete noticeable by lack of any further increase in temperature—arising from the exothermic nature of the reaction—and colour change.

The solvent used in step (i) of the process is typically ethanol or iso-propanol which have boiling points of 78.5°C and 82.4°C, respectively. The crude wax is typically combined with solvent at a ratio of one part (by weight) wax to nine parts solvent although ratios of 1:8 to 1:20 can also be used. Heating can be for 5 to 60 minutes although a heating time of about 30 minutes is usually adequate.

As indicated above, the upper phase formed in step (ii) contains the wax of interest. The lower phase is a resinous fraction referred to as "pitch" which contains wax of lower quality.

In step (iii), filtration or centrifugation are advantageously used to separate wax from oil-containing solvent. However, other methods known to those of skill in the art can be used.

Steps (i) to (iii) are repeated from 2 to typically no more than 5 times. The number of times the steps are repeated largely depends on the amount of pitch present in the crude wax, the rate with which the pitch settles and the rate of wax crystallisation. It appears that pitch that does not settle fast enough is occluded within the wax crystals.

The heating of the wax in step (v) of the process is advantageously carried out under an oxygen-free gas. This allows better control over the oxidation of the wax which is not initiated until the composition reaches the desired temperature. The oxygen-free gas is typically an inert gas such as nitrogen.

The oxidising material used in step (V) can be chromic acid, potassium permanganate, transition metals such as salts of noble metals such as platinum and palladium, pentavalent vanadium, cobalt (III), cerium (IV) thallium (III), mercury (II), cupric solutions, specific enzymes, and oxygen gas (see R. Stewart, "Oxidation Mechanisms, Application to Organic Chemistry", W.A. Benjamin Inc., 1964). Preferred oxidising materials are air, oxygen, or mixtures of oxygen, nitrogen and ozone.

With regard to the final step of the process, step (vi), one of skill in the art would be able to determine when removal of the intermediate peroxide products is complete. Completion typically takes from 30 minutes to 2 hours. However, longer or shorter periods can be used depending on the degree of oxidation achieved. The inert gas used in this step is typically nitrogen.

In step (v) of the process, oxidation can be enhanced by using a catalyst. Suitable catalysts include cobalt or manganese borates and resinates (A.J.C. Andersen, *Refining of Oils and Fats for Edible Purposes*, Second Revised Edition, P.N. Williams, ed., Pergamon Press, 1962), ferrous salts, and Fenton's reagent which consists of ferrous salts and H_2O_2 (Roger A Sheldon and Jay K. Kochi, *Metal Catalyzed Oxidations of Organic Compounds*, Academic Press, 1981).

The wax compositions obtained from step (vi) of the process according to the second aspect of the invention can be further decolourised, if desired, with adsorbents or by pitch inducement. Each of these methods will now be briefly described.

Use of Adsorbents

Suitable adsorbents include activated carbons, resins, activated alumina and silica. Carbons obtained from commercial sources are satisfactory and with a wax to carbon ratio of 1:3 white wax can be produced. It is also possible to manufacture carbons that are selective towards a particular colour.

The following are typical steps in the decolourisation of the wax composition with activated carbon:

a) Wax from step (v) is heated with a lower alcohol as solvent at the boiling point of the solvent for 30 to 60 minutes with wax to activated carbon ratios of between 1:0.5 and 1:3.

b) The molten slurry is filtered hot.

c) The wax and solvent recovered is cooled until the wax crystallises and is separated by filtration.

Pitch Inducement

In the pitch inducement method, colour can be removed without the use of adsorbents. The method involves heat treatment and fractionation

which results in waxes of various intensity of colour from a golden yellow to cream.

Typical steps in the reduction of the colour of the wax composition with pitch inducement follow.

(a) Wax from step (v) is heated with a lower alcohol as solvent at the boiling point of the solvent for 30 to 60 minutes.

(b) The phases of the solution from (a) are separated and the upper phase decanted while hot.

(c) The separated upper phase from (b) is allowed to cool and the crystallised wax separated from the solvent.

(d) Wax from (c) is heat treated at 80 to 110°C in the absence of solvent for typically 15 minutes to 3 hours.

(e) Steps (a) to (d) are repeated until the desired colour grade is achieved.

The crude sugar cane wax can be prepared by methods known to those of skill in the art. A suitable method is described, for example, in US Patent No. 2,508,002, the entire content of which is incorporated herein by cross-reference. A brief description of a suitable process follows.

Crude Wax Extraction

Sugar filter cake is steam heated and charged to a continuous reactor where it is mixed with solvent (naphtha) and held at the desired temperature and pressure. Wax is extracted into the solvent, which is subsequently separated from the filter cake. The separated wax-containing solvent is then passed through a flash drum and an evaporator to separate the crude wax from the solvent. The resulting filter cake is then steam stripped to recover residual solvent.

The composition of crude sugar cane wax is typically as presented in Table II.

Table II

Composition of Crude Sugar Cane Wax

Component	Composition (% w/w)
Wax Ester	5.9–8.5
Alkyl Ketone	3.2–1.6
Tri-Glyceride	0–1.6
Alcohol	7.9–8.3
Free Fatty Acid/Sterol	5.9–7.8
Polar Lipid	73.2–76.1

Advantages of the wax composition according to the invention and the process for preparing the composition are as follows:

1) The process produces a potential food grade vegetable wax product, which can be used as a replacement for mineral waxes in a number of food or non-food applications, including (but not limited to) chewing gum base, cheese coating, and fruit coating.

2) The process is simple and of low cost and enables economic use of wax for applications indicated in (1).

3) The wax product is colourless or has low colour (pale yellow) and little or no odour and taste.

4) The wax product has a hardness comparable to carnauba wax.

5) The wax product has good temperature stability as compared to other vegetable waxes, such as carnauba and rice wax.

Having broadly described the invention, examples of the preparation of wax composition will now be given.

Example 1

Multiple portions of wax composition were prepared as follows: one hundred grams of crude sugar cane wax was combined with 900 grams of ethanol in a round bottom flask. The mixture was heated in a heating mantle

to 78.5°C for 30 minutes under reflux. The solution was removed from the heating mantle and the phases of pitch and the paler wax were allowed to separate. The paler wax was decanted into another round bottom flask while the wax mixture was still in solution or only partially crystallised at 65 to 75°C. The mixture was again heated to 78.5°C for 10 minutes. The paler wax was decanted to separate it from the pitch. The heating and separation processes were repeated about four times or until no visible pitch separated from the paler wax. The pitch was reheated with about 100 grams of ethanol to recover additional paler wax. This was combined with the previously collected paler wax. The paler wax was then cooled slowly to room temperature and then in an ice bath. The cooled wax was filtered and remelted in a hot bath, in the presence of nitrogen, at a temperature between 90 and 140°C. Air or ozone was blown into the molten wax by means of a sparger until the temperature of the wax stabilised to a constant value or until there was no further visible change in the colour of the wax. The overall process was executed within several hours depending on the temperature and air distribution.

Wax composition produced by the above process had the following properties: pale yellow in colour with a sweet smell and little or no taste. The compositions of waxes are summarised in the following table.

Table III

Components of Wax Compositions of Example 1

Component	Composition (% w/w)	
	Ethanol fractionated then oxidised with air	Ethanol fractionated then oxidised with ozone
Wax Ester	6.2–11	6.2–7.7
Aldehyde	8.1–9.5	2.5–9.5
Tri-Glyceride	0.5–3.0	0.5–3
Alcohols	11.5–44.5	1.8–44.5
Free Fatty Acid + Sterol + Polar Lipid	36.8–70	36.8–87.2

The make-up of the composition obtained following the oxidation step depends on the extent of oxidation. If complete oxidation is achieved, the only substantial component left will be free fatty acid. However, oxidation needs to be only to the extent that sufficient colour is removed.

Example 2

Multiple portions of wax composition were again prepared. One hundred grams of crude sugar cane wax was combined with 900 grams of isopropanol in a round bottom flask. The mixture was heated in a heating mantle to 82.4°C. The mixture was cooled slowly to room temperature and then in an ice bath. The wax was filtered and transferred into another round bottom flask. To the wax, 450 grams of ethanol was added and the mixture heated to 78.5°C for 30 minutes. Fractionation and oxidation of this wax was carried out as in Example 1.

Wax composition produced by the above process had the following properties: pale yellow in colour with a sweet smell and little or no taste. Compositions obtained are summarised in the following table.

Table IV

Components of Wax Compositions of Example 2

Component	Composition (% w/w)
Wax Ester	10.5–11
Aldehyde	7.4–8.1
Tri-Glyceride	0–0.6
Alcohols	11.5–18.8
Free Fatty Acid + Sterol + Polar Lipid	63.4–70

Yields of fractions produced using processes such as described in Examples 1 and 2 are presented in Table V.

Table V

Fractionation Yield

Fraction	Yield (%)	
	Example 1	Example 2
Oil	24–30	53–55
Pitch	26–35	20–25
Wax Composition	34–48	20–25

It will be appreciated that many changes can be made to the processes and compositions as exemplified above without departing from the broad ambit and scope of the invention.

CLAIMS

1. A wax composition comprising on a weight basis: wax esters, 6.2–11%; aldehydes, 2.8–9.5%; tri-glycerides, 0–3%; alcohols, 1.8–44.5%; and, free fatty acids, sterols and polar lipids, 36.8–87.2%.

2. A process for preparing a wax composition from crude sugar cane wax, the process comprising the steps of:

i) heating a solution of the crude wax with a lower alcohol as solvent at the boiling point of the solvent;

ii) allowing phase separation of the solution from (i) and decanting the upper phase while hot;

iii) allowing the separated phase from (ii) to cool and separating crystallised wax from the solvent;

iv) repeating steps (i) to (iii) using the wax from (iii) until all pitch has been removed from the wax;

v) heating the wax to between 90 and 140°C and oxidising molten wax with oxidising material; and

vi) continuing the heating under an inert gas on completion of the oxidation step until intermediate peroxide products are removed.

3. The process according to claim 2, wherein said lower alcohol is ethanol or iso-propanol.

4. The process according to claim 2, wherein said crude wax is combined with solvent at a ratio of 1:8 to 1:20 by weight.

5. The process according to claim 4, wherein said ratio is 1:9.

6. The process according to claim 2 wherein in step (i) said solution is heated for 5 to 60 minutes.

7. The process according to claim 6, wherein said solution is heated for about 30 minutes.

8. The process according to claim 2, wherein in step (iii) said separation is by filtration or centrifugation.

9. The process according to claim 2, wherein steps (i) to (iii) are repeated from 2 to 5 times.

10. The process according to claim 2, wherein in step (v) said heating is carried out under an oxygen-free gas.

11. The process according to claim 10, wherein said gas is nitrogen.

12. The process according to claim 2, wherein said oxidising material of step (v) is selected from the group consisting of air, oxygen, and mixtures of oxygen, nitrogen and ozone.

13. The process according to claim 2, wherein in step (v) said oxidation is carried out in the presence of a catalyst.

14. The process according to claim 10, wherein said catalyst is selected from the group consisting of a borate or resinate of cobalt or manganese, ferrous salts, and Fenton's reagent.

15. The process according to claim 2 comprising the further steps of:

vii) heating wax from step (vi) with a lower alcohol as solvent at the boiling point of the solvent with activated carbon present at a wax to carbon ratio of 1:0.5 to 1:3;

viii) filtering the molten slurry while hot;

ix) allowing the recovered wax/solvent mixture to cool and separating crystallised wax therefrom.

16. The process according to claim 2 comprising the further steps of:

(vii) heating wax composition from step (vi) with a lower alcohol as solvent at the boiling point of said solvent for 30 to 60 minutes;

(viii) allowing phase separation of the solution from (vi) and decanting the upper phase while hot;

(ix) allowing the separated upper phase from (viii) to cool and separating crystallised wax from said solvent;

(x) heating wax from (ix) in the absence of solvent for 15 minutes to 3 hours; and

(xi) repeating steps (vii) to (x) until the desired degree of decolourisation is achieved.

17. A comestible which includes the wax composition of claim 1.

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 98/00234

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: C11B 11/00; C08L 91/06; A23D 9/00, 9/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: C11B 11/00; A23D 9/00, 9/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Derwent Abstract Accession No: 92-111526/14, Class D23 (D21), JP 04-057894 A (KOBAYASHI KOSE KK) 25 February 1992 Abstract	1
A	Derwent Abstract Accession No: 51771C-30, Class D21, DT 2856-277 (HENKEL KG AUF AKTIEN) 17 July 1980 Abstract	1
A	Derwent Abstract Accession No: 95-085711/12, Class B07, D23 (D13, D21), JP 07-011285 A (NISSHIN OIL MILLS LTD) 13 January 1995 Abstract	2-17

[X] Further documents are listed in the continuation of Box C

[ ] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 May 1998	6 May 1998
Name and mailing address f the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	Auth rized officer GAYE HOROBIN Telephone No.: (02) 6283 2069

Form PCT/ISA/210 (second sheet) (July 1992) copbko

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 98/00234

C (Continuation) **DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Derwent Abstract Accession No: 94-269708/33, Class D23, JP 06-200289 A (NIPPON PETROCHEMICALS CO LTD) 19 July 1994 Abstract	2-17
A	Derwent Abstract Accession No: 94-269706/33, Class D23, JP 06-200287 A (NIPPON PETROCHEMICALS CO LTD) 19 July 1994 Abstract	2-17

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ _____

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA	Date of receipt of DEMAND

Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION

Applicant's or agent's file reference: 97520KFGA

International application No.	International filing date *(day/month/year)*	(Earliest) Priority date *(day/month/year)*
PCT/AU98/00234	7 APRIL 1998 (7.4.98)	7 APRIL 1997 (7.4.97)

Title of invention: FOOD GRADE WAX AND PROCESS FOR PREPARING SAME

Box No. II APPLICANT(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

JAMES COOK UNIVERSITY OF NORTH QUEENSLAND
Townsville, Queensland 4811
Australia

Telephone No.:

Facsimile No.:

Teleprinter No.:

State *(that is, country)* of nationality: AU

State *(that is, country)* of residence: AU

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

CSR LIMITED
Level 6
Hall Chadwick Building
46 Edward Street
Brisbane, Queensland 4000
Australia

State *(that is, country)* of nationality: AU

State *(that is, country)* of residence: AU

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

VALIX, Marjorie Gan
26 Andrews Street
West Ryde, New South Wales 2114
Australia

State *(that is, country)* of nationality: AU

State *(that is, country)* of residence: AU

☐ Further applicants are indicated on a continuation sheet.

International application No.
PCT/AU98/00234

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is [X] agent [ ] common representative

and [X] has been appointed earlier and represents the applicant(s) also for international preliminary examination.

[ ] is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.

[ ] is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

CULLEN & co.
Level 12, 240 Queen Street
Brisbane, Queensland 4000
Australia

Telephone No.: 07 3221 8761

Facsimile No.: 07 3229 3384

Teleprinter No.:

[ ] **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments:*

1. The applicant wishes the international preliminary examination to start on the basis of:

[X] the international application as originally filed

the description [ ] as originally filed
[ ] as amended under Article 34

the claims [ ] as originally filed
[ ] as amended under Article 19 (together with any accompanying statement)
[ ] as amended under Article 34

the drawings [ ] as originally filed
[ ] as amended under Article 34

2. [ ] The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. [ ] The applicant wishes the start of the international preliminary examination **to be postponed** until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: ENGLISH

[X] which is the language in which the international application was filed.
[ ] which is the language of a translation furnished for the purposes of international search.
[ ] which is the language of publication of the international application.
[ ] which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby **elects all eligible States** *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes **not to elect:**

International application No.
PCT/AU98/00234

Box No. VI CHECK LIST

The demand is accompanied by the following elements. in the language referred to in Box No. IV, for the purposes of international preliminary examination:			For International Preliminary Examining Authority use only: received	not received
1. translation of international application	:	sheets	☐	☐
2. amendments under Article 34	:	sheets	☐	☐
3. copy (or. where required. translation) of amendments under Article 19	:	sheets	☐	☐
4. copy (or, where required. translation) of statement under Article 19	:	sheets	☐	☐
5. letter	:	sheets	☐	☐
6. other *(specify)*	:	sheets	☐	☐

The demand is also accompanied by the item(s) marked below:

1. [X] fee calculation sheet
2. [ ] separate signed power of attorney
3. [ ] copy of general power of attorney; reference number, if any:
4. [ ] statement explaining lack of signature
5. [ ] nucleotide and or amino acid sequence listing in computer readable form
6. [ ] other *(specify)*:

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature. indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

Ron Haliday

Ronald A. Haliday
Registered Patent Attorney
Cullen & Co.

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3. [ ] The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below. does not apply. [ ] The applicant has been informed accordingly.
4. [ ] The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5. [ ] Although the date of receipt of the demand is after the expiration of 19 months from the priority date. the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

Copy for the designated Office (DO/US)

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

COMMUNICATION IN CASES FOR WHICH NO OTHER FORM IS APPLICABLE

To:
CULLEN & CO.
Level 12
240 Queen Street
Brisbane, QLD 4000
AUSTRALIE

Date of mailing (*day/month/year*) 17 September 1998 (17.09.1998)	
Applicant's or agent's file reference 97520KFGA	**REPLY DUE** see paragraph 1 below
International application No. PCT/AU98/00234	International filing date (*day/month/year*) 07 April 1998 (07.04.1998)
Applicant JAMES COOK UNIVERSITY OF NORTH QUEENSLAND	

1. ☐ REPLY DUE within _____ months/days from the above date of mailing

☐ NO REPLY DUE, however, see below _____

☒ IMPORTANT COMMUNICATION

☐ INFORMATION ONLY

2. COMMUNICATION:

Please disregard Form PCT/IB/346 erroneously mailed by the International Bureau on 12 August 1998 regarding the filing of Amendments of the claims under Article 19.

A copy of this notification has been sent to the receiving Office and to the designated States.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer
Athina Nickitas-Etienne

Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

United States Patent and Trademark Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 12 November 1998 (12.11.98)	
International application No. PCT/AU98/00234	**Applicant's or agent's file reference** 97520KFGA
International filing date (day/month/year) 07 April 1998 (07.04.98)	**Priority date** (day/month/year) 07 April 1997 (07.04.97)
Applicant VALIX, Marjorie, Gan	

1. The designated Office is hereby notified of its election made:

   [X] in the demand filed with the International Preliminary Examining Authority on:
   29 October 1998 (29.10.98)

   [ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was
   [ ] was not

   made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer
Athina Nickitas-Etienne

Telephone No.: (41-22) 338.83.38

...TENT COOPERATION TRE... Y

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

CULLEN & CO.
Level 12
240 Queen Street
Brisbane, QLD 4000
AUSTRALIE

Date of mailing (day/month/year)
24 September 1999 (24.09.99)

Applicant's or agent's file reference
97520KFGA

IMPORTANT NOTIFICATION

International application No.
PCT/AU98/00234

International filing date (day/month/year)
07 April 1998 (07.04.98)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address
JAMES COOK UNIVERSITY OF NORTH QUEENSLAND
Townsville, QLD 4811
Australia

State of Nationality: AU
State of Residence: AU
Telephone No.:
Facsimile No.:
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address
JAMES COOK UNIVERSITY
Townsville, QLD 4811
Australia

State of Nationality: AU
State of Residence: AU
Telephone No.:
Facsimile No.:
Teleprinter No.:

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[X] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer
Athina Nickitas-Etienne

Telephone No.: (41-22) 338.83.38